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Income Shifting and Organizational Form Choice: Evidence from Europe *

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Abstract

We study the effect of differential taxation of personal and corporate tax bases on income shifting for 24 European countries over the period 2000-2016. The data cover 48 sectors at the 2-digit industry level. Our results provide evidence of significant income shifting via legal form choice. Specifically, a 1%-point increase in the tax differential between personal and corporate income tax rates results in a 0.8% increase in the corporate share of active firms and a 0.3% increase in the corporate share of employment. Moreover, we find that personal income tax revenues paid by self-employed decrease by about 0.3%.

JEL codes: H25; L26

Keywords: income shifting, corporate income tax, personal income tax, incorporation

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1 Introduction

Tax competition and tax avoidance remain controversial topics in Europe, as illustrated by the European Commission (2018a) with the recent debate on aggressive tax planning. The decline in the tax burden of corporations over the past decades is at the core of the issue, especially in relation to personal tax rates.[1] Figure 1 plots the evolution over time of the top statutory tax rates on personal and corporate income in Europe and their difference. It shows that the tax differential between the two has been steeply increasing in the 2000s, and despite a slowdown in recent years, it still displays a clear upward trend.

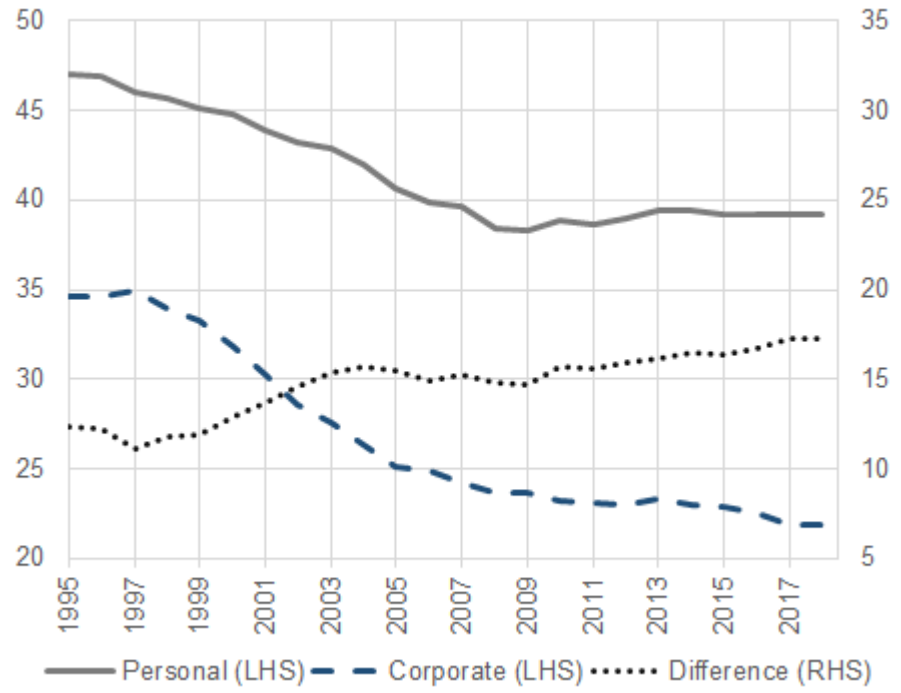
An increasing differential between personal and corporate income tax rates creates an incentive for entrepreneurs to choose the least taxed organizational form. This encourages income shifting across the personal and corporate income tax bases. This expands the corporate tax base at the expense of the personal income tax base, and could help explain the robustness of corporate tax revenues to declining corporate tax rates. If large enough, the effect could counteract the fall in corporate tax revenue that would be expected from decreasing corporate tax rates.[2] However, when average personal tax rates exceed corporate tax rates, the gains in corporate income tax revenues are offset by losses in personal income tax revenues.

In this paper we assess the magnitude of this effect by estimating the tax elasticity on income shifting. In the past various papers have measured this elasticity with various outcomes on its magnitude. We use a larger data set covering nearly all European countries. We also estimate the impact

[1] Other factors affecting the corporate tax burden are the increase in the corporate share of the financial sector, the decline of non-corporate sectors, the implementation of tax broadening policies, higher implicit corporate tax rates related to less generous offset rules and greater profitability of the economy. See Nicodème (2007) and Keen and Konrad (2013).

[2] In Europe, corporate tax revenues measured as percentage of total taxes are on a raising path whereas revenues from the personal income tax are declining, as shown by figure A1 in the appendix. Income shifting is acknowledged as one of the factors that can explain diverging trends in corporate tax rates and revenues, see Sørensen (2007).

Figure 1: Average top statutory income tax rates in Europe, percentage



Source: European Commission and own calculations. *Notes:* The figure plots the average top statutory corporate and personal income rates (including surcharges, expressed in percentage) for 27 European Union countries plus the United Kingdom, Norway and Iceland. The dotted line plots the difference between the two series.

on incorporation on the personal income tax base, using European data on the tax revenues of self-employed. Our data include 24 countries over 2000–2016, covering 48 2-digits industry level sectors that can be aggregated into 12 1-digit level sectors. Our estimates imply that a reduction in the tax differential leads to an increase in the corporate tax base. Specifically, a 1%-point increase in the tax differential between personal and corporate income tax rates results in a 0.3-0.8% increase in the corporate share of firms and a 0.2-0.3% increase in the corporate share of employment. The outcomes depend on whether we measure corporate shares in terms of active or new

firms. This in turn corresponds to elasticities in the range of 0.03-0.15. In addition, we assess the impact of an increase in the corporate share in the economy on the tax base. Our estimates suggest that the projected 0.8% increase in the corporate share of active firms, associated with a 1%-point increase in the tax differential, results in approximately 0.3% decrease in the personal income tax revenues paid by the self-employed. Results are robust to alternative specifications.

When deciding over organizational form, entrepreneurs weight potential tax and non-tax costs and benefits of one legal form against the other. In the United States, corporate tax rates exceed personal tax rates, and can therefore discourage companies that want to incorporate from doing so.[3] In Europe, corporate tax rates are usually lower than personal tax rates. Thus, entrepreneurs may have an incentive to incorporate to be able to reclassify income from personal to corporate tax bases.[4]

De Mooij and Nicodème (2008) consider 17 European countries over 1997-2003 and find an elasticity of the corporate share in the range of 0.2-0.5 for a 1% increase in tax differential. The size of the impact depends on whether the corporate share is measured in terms of new or existing number of firms or employees in corporate firms. These estimates are in line with what found for the United States by Liu (2014) but larger than those of Goolsbee (2004), who reports elasticities in the order of 0.1-0.15.[5] Considering comparable country specific evidence, Tazhitdinova (2016) reports an elasticity of the hazard rate of incorporation with respect to tax savings of 0.2 for the United Kingdom. Finally, Egger et al. (2009) estimate that a 1%-

[3] As pointed out by as pointed out by Gordon and MacKie-Mason (1994), Mackie-Mason and Gordon (1997), Gordon and Slemrod (1998), Goolsbee (1998, 2004) , Liu (2014) and Chen et al. (2018). Until the tax reform of the Trump administration in 2018, the United States displayed corporate rates exceeding personal income tax rates.

[4] As stressed by De Mooij and Nicodème (2008), Egger et al. (2009), Thoresen and Alstadsæter (2010), Alstadsæter and Wangen (2010), Alstadsæter and Jacob (2013), Edmark and Gordon (2013) and Tazhitdinova (2016). Most studies focus on Scandinavian countries or the United Kingdom (evidence is hard to generalize to Europe as a whole).

[5] See also table A1 in the appendix for a comparison of existing estimates.

point increase in the effective shareholder corporate tax burden in Europe reduces the probability to incorporate by about 0.1%-points on average.

Our contribution to the literature is twofold. First, to our knowledge we are the first to directly evaluate the impact of larger corporate share in the economy on personal income taxes paid by the self-employed. De Mooij and Nicodème (2008) calculate the impact of income shifting on the corporate tax base indirectly and find that income shifting can account for approximately 12 to 21% of corporate tax revenues. More recently, Devereux et al. (2014) estimate a 0.05-0.08 elasticity of the share of income taken as profit with respect to the difference between the personal and corporate tax rates for the United Kingdom. In addition, we provide updated estimates of the impact of the tax differential on corporate shares in the economy in Europe. Our results cover a larger number of countries as well as a longer time span relative to existing estimates and include several robustness checks that were not performed by previous literature.

The paper is structured as follows. Section 2 discusses the theoretical background and the resulting empirical methodology. Section 3 describes the data. Section 4 presents the results for income shifting and section 5 those for the tax base effects. Section 6 concludes.

2 Methodology

Our empirical methodology rests upon a stylized theoretical framework provided by Mackie-Mason and Gordon (1997) and Liu (2014).[6] These models depict firms choice over the legal form as determined by a comparison of the net tax cost from incorporation to its net non-tax (firm specific) costs and benefit. As stressed by De Mooij and Nicodème (2008), tax costs of incorporation in Europe often are tax gains. Non-tax benefits of incorporation are

[6] A similar setup is also adopted by Goolsbee (1998, 2004). Egger et al. (2009), Kotlikoff and Miao (2010) and Chen et al. (2018) later developed more complex and detailed models.

limited liability and improved access to capital whereas non-tax costs consist of minimum capital requirements and legal and reporting obligations.[7]

Formally, non-corporate entrepreneurs earn gross income I^p, which is taxed under the personal income tax rate τ^p. Incorporated entrepreneurs earn gross income I^c, taxed at the corporate rate τ^c. Profit maximizing entrepreneurs will incorporate whenever net profit from incorporation exceeds net profit derived from the non-corporate form. That is, given that:

$$(1-\tau^c)I^c > (1-\tau^p)I^p \tag{1}$$

Where gross corporate income is a function of the gross personal income plus a factor δ representing the non-tax costs of incorporation, such that $I^c = I^p(1+\delta)$. δ has no sign restrictions and includes factors such as limited liability, access to capital, minimum capital requirements and compliance and reporting costs related to incorporation. Firms will optimally choose to incorporate when:

$$(1+\delta) > \frac{(1-\tau^p)}{(1-\tau^c)} \tag{2}$$

That is, incorporation decisions will be based on the relative taxation of corporate and personal income as well as the net non-tax costs from incorporation.[8] Thus, an empirical model based on this theoretical framework can be formalized as follows:[9]

$$CS_{jit} = \beta_0 + \beta_1(\tau^p_{it} - \tau^c_{it}) + \beta_2 X_{it} + \lambda_t + \gamma_j + \varepsilon_{jit} \tag{3}$$

[7]Limited liability protects the entrepreneur's personal assets (i.e. only capital invested in the firm can be lost). Public trading of shares of corporations may facilitate attracting capital. See Egger et al. (2009) for a theoretical framework. Incorporation may be more costly for entrepreneurs who engage in tax evasion, as it may be relatively easier to evade taxes under sole proprietor legal form. Due to measurement problems, we disregard tax evasion and focus on tax avoidance.

[8]The optimal decision on incorporation depends on the relative weight of corporate and personal taxes under the assumption that equity taxes are zero.

[9]Note that the latter can be derived by log-linearizing equation 2 and keeping in mind that $log(1+t) \approx t$ for small enough t.

Where CS_{jit} is the corporate share of business in sector j in country i at time t, measured both in terms of number of firms and persons employed, for active and new firms. τ_{it}^{p} and τ_{it}^{c} represent the personal and the corporate top statutory income tax rates, respectively. X_{it} is a vector of control variables, λ_t represents time fixed effects, γ_j industry specific effects and ε_{it} is a mean zero error term. The main coefficient of interest is β_1, which should enter the equation with a positive sign. That is, a higher personal income tax rate relative to the corporate income tax rate is likely to result in firms' incorporation and increase the corporate share of firms.

In contrast to De Mooij and Nicodème (2008), we include control variables X_{it} in our baseline specification. Specifically, we use an indicator for the ease of starting a (corporate) business to account for non-tax costs and benefits of incorporation. In addition, we include real GDP growth, which accounts for cyclical economic factors and thus for changes in the distribution of taxable income.[10] More generally, real GDP growth proxies firm's profitability. At higher growth rates entrepreneurs may fall within higher personal and corporate tax brackets. When $\tau_p > \tau_c$, and given the greater progressivity of personal tax rates, higher GDP growth may imply that the tax differential matters more.

Next, we investigate whether the share of corporate firms in the economy has a negative impact on the personal income tax base by estimating the following equation:

$$PERS_{it} = \alpha_0 + \alpha_1 CS_{itj} + \alpha_2 X_{it} + \lambda_t + \gamma_j + \epsilon_{it} \tag{4}$$

$PERS_{it}$ is the share of personal taxes paid by the self-employed in total taxes and CS_{itj} is the corporate share of business in the economy, measured in terms of number of active firms. The coefficient of interest α_1 should enter

[10]See also the data section for more details on the variables used. De Mooij and Nicodème (2008) include these controls in their robustness section but they are constrained by data availability for the ease of doing business, as the latter was only observed for one year of their sample.

the equation with a negative sign. That is, an increase in the corporate share of businesses in the economy is expected to reduce the personal income tax base. This would provide additional direct evidence for income shifting across tax bases. ϵ_{it} is a mean zero error and remaining variables are as discussed above.

Equations 3 and 4 are estimated using ordinary least squares (OLS) and including time and industry fixed effects. Country fixed effects are not included as we add instead dummies accounting for data breaks in several countries.[11] These are expected to account for some of the country specific variation, as is also the case for the inclusion of real GDP growth and of the ease of doing business (EDB) indicator, which is relatively stable over time. Section 5 tests the robustness of the results by using an instrumental variable (IV) approach to account for the endogeneity problem that could arise from estimating equation 3 with OLS.

3 Data

Our sample consists of 24 European countries observed over the period 2000–2016. Summary statistics for the main variables of interest are reported in table 1. Table A2 in the appendix provides definitions and sources.

The dependent variable is the corporate share of economic activity, measured by the number of firms or by persons employed in the population of new or existing (active) firms. Eurostat's Business Demography database provides information on the number of (persons employed in) active and new firms for (i) sole proprietors, subject to personal income tax rates, (ii) private or publicly quoted joint stock companies with limited liability, subject to the corporate tax rate, and (iii) partnerships. The latter can be both personally owned limited and unlimited liability firms, and therefore can be taxed under both personal and corporate tax rates. The corporate share of firms

[11] See data section and table A4 for more details on the breaks in the data series.

(employment) in the economy is obtained by dividing the number of (employed persons in) limited liability firms by the sum of (employed persons in) limited liability and sole proprietorship firms, multiplied by 100. This is done for both new and existing firms, here we follow De Mooij and Nicodème (2008). Table A3 in the appendix reports country specific corporate share averages.[12]

Table 1: Summary statistics of the main variables

	1-digit		2-digits	
	mean	sd	mean	sd
Corporate share, number of active firms	42.96	24.59	50.18	25.82
Corporate share, number of new firms	37.79	25.15	43.23	26.65
Corporate share, employed persons in active firms	75.69	20.77	81.73	19.62
Corporate share, employed persons in new firms	48.33	26.11	55.32	27.24
Statutory tax rate on personal income	41.78	11.75	42.87	11.08
Statutory tax rate on corporate income	22.69	6.690	23.27	6.464
Tax differential	19.09	10.39	19.60	9.917
Annual real GDP growth	2.087	3.495	2.003	3.329
Economic freedom	69.33	5.235	69.07	5.048
Ease of starting a business	84.42	9.233	84.45	9.446
KOF globalization index	79.53	7.127	79.63	7.367
Observations	3,542		10,607	
Self-employed tax revenues, % corporate taxes	20.23	12.90	20.93	13.17
Self-employed tax revenues, % direct taxes	13.11	11.05	13.54	11.55
Observations	3,025		8,877	
Centre-left government in deficit	0.409	0.492	0.384	0.486
Observations	2,911		8,745	

Notes: Own calculations. We select on observations for which all measures of corporate shares are observed.

Business Demography data includes activities relating to industry, construction, distributive trades and services aggregated at the 2-digit NACE indus-

[12]The table reveals substantial heterogeneity in corporate shares across countries. Our results however remain robust to alternative sample definitions.

try level. The industry classification was changed from NACE 1.1 to NACE 2 codes in 2008. We match data across the two classifications as reported in table A5, resulting into 48 2-digit industries which can be aggregated into 12 1-digit industries.[13] We include a dummy in the main regression to account for the break in the series. In addition, we create additional country-specific dummies to account for breaks in corporate shares data.[14]

Our main independent variable is the tax differential between personal and corporate tax bases. We follow the literature and use top statutory income tax rates taken from the European Commission. However, the decision to incorporate will mostly affect small and medium sized firms, which can often make use of reduced corporate tax rates in countries with a progressive system. Thus, we replace the top statutory corporate tax rate with the combined targeted corporate rates collected from the OECD whenever available.

The use of statutory rates is based on the following reasons. First, as the choice over the legal from is discrete, we are interested in average effective tax rates rather than marginal ones. As argued by Mackie-Mason and Gordon (1997), top statutory rates are expected to strongly correlate with effective personal tax rates, even though non-corporate entrepreneurs may face different personal income rates. Similarly, although there may be provisions for lower corporate tax rates depending on firms profits, changes in effective tax rates should be mostly related to changes in top statutory corporate tax rates.[15] Second, Devereux and Griffith (2003) showed that as profitability of firms increases, average effective tax rates approach statutory tax rates.

[13]The reclassification is based on the NACE 1.1 codes and broadly follows that used by Bergner and Heckemeyer (2017).

[14]Business Demography data is mostly based on firm-level or administrative sources aggregated by the National Statistical Institutes. Since data quality has improved over time, some sources have been changed and methodologies updated, breaks are present in the data, as reported in table A4. A set of country-specific dummies equal to one starting from the break year is included in all regression equations.

[15]The European Commission provides data on effective average tax rates between 2007 and 2016. The correlation between this indicator and the statutory corporate tax rate is 0.9364, in line with what claimed by Mackie-Mason and Gordon (1997). Figure A2 in the appendix shows that the two measures are co-moving.

Given our main dependent and independent variables, we make the following sample choices. We drop Estonia and Malta due to poor data quality.[16] In addition, we exclude countries for which we do not have data for six consecutive years or more, namely Croatia, Greece, Switzerland, Romania and Bulgaria.[17] Observations before 2000 are also dropped as data is only available for Finland and the United Kingdom. Finally, to ensure comparability of results across specifications, we select on observations for which all types of corporate shares measures are available. Countries covered are listed in table A3 in the appendix.

Regarding control variables, annual data on real output in chain-linked volumes is taken from Eurostat. The World Bank EDB database provides an overall indicator on the ease of starting a business, which contains information regarding the time, costs, number of procedures and minimum capital (in percent of income per capita) necessary to start a business for a small-to medium-size limited liability company. Thus, the indicator is expected to reflect non-tax costs and benefits of incorporation. As annual data is available from 2003, we assume the measure to be constant and equal to the last available values whenever data is missing.[18]

In the robustness section, we replace the EDB indicator with the overall indicator for economic freedom provided by the Heritage Foundation and available from 2000. Moreover, we instrument the tax differential with the *de facto* KOF Globalization Index developed by Gygli et al. (2018). In principle, a more globalized economy implies intensified international competition for capital and therefore could lead to lower corporate tax rates relatively to the personal tax rates. In addition, we use a dummy equal to one if the

[16]Estonia displays several breaks and implausible corporate shares. Malta has several missing observations in multiple sectors in recent years and a break in the series. In both countries, the corporate and personal tax rates are equal over the entire time span.

[17]Sole proprietors data is not reported until 2011 for Romania (5 consecutive years). In Bulgaria, personal and corporate tax rates are equal over 2008-2016 (4 consecutive years).

[18]This assumption seems reasonable the measure is stable over time. In some countries, we extend the indicator over the period 2000–2003 (or beyond that for countries for which the index is not available until later years) and/or for 2016.

government of a country is left-wing oriented *and* and there is a government budget deficit and zero otherwise.[19] We presume that center-left governments faced with revenue needs will try to collect relatively more tax revenues from corporations than right-wing governments. This in turn would reduce the tax differential. Data on government orientation is from the World Bank Political Indicators Database (2017) and information on the budget deficit is taken from Eurostat.

Regarding the tax base, we measure the share of taxes paid by the self-employed on a yearly basis starting from 2004. The Taxation Trends Report published by the European Commission (2018b) provides information on taxes paid by the self-employed as a percentage of total taxes and of GDP. We use this data and information on total direct tax revenues (i.e. including personal income taxes) to calculate the share of taxes paid by self-employed relatively to the total tax base. That is, we take the ratio of taxes paid by the self-employed to total direct taxes paid, multiplied by 100. As an alternative for total direct taxes, we also use total corporate taxes.

4 Income shifting

4.1 Baseline results

We report the results obtained by estimating equation 3 in table 2 and 3. Table 2 shows results at the 1-digit industry level. The first two columns refer to the corporate share of active and new firms, whereas the last two refer to the corporate share of employment for existing and new firms. Overall, a higher differential between personal and corporate tax rates significantly increases the corporate share of the economy. Specifically, a unit rise in the tax differential increases the corporate share of active firms by 0.3 and of new firms by 0.2 whereas it increases the corporate share of employment in active

[19]For more on the literature using political economy variables as instruments for taxes see Da Rin et al. (2011) and Liu (2014).

firms by 0.2 and in new firms by 0.1. Thus, tax differentials affect the corporate share of firms more strongly than the corporate share of employment. Small enterprises may be more likely to shift personal and corporate income across tax bases than large (mostly incorporated) firms.[20] Moreover, both for the share of corporate firms and of corporate employment, the coefficient for active firms is larger than that of new firms. This could reflect the fact that most (small) firms start off as sole proprietors and consider incorporation only at later stages.

Regarding control variables, an improvement in the ease of starting a business indicator or higher real GDP growth significantly increases the corporate share of the economy. In both cases, their impact on corporate shares is larger when the latter is measured in terms of number of firms than of employed persons. This could reflect large firms dominance in employment shares.

Table 3 reports the results obtained when using data aggregated at the 2-digit industry level. In comparison with table 2, the effect of the tax differential on corporate shares is somewhat smaller. On average, a unit rise in the tax differential implies a 0.2 increase in the corporate share of active firms, and a 0.1 increase in the share of new firms and of the employment share in active firms. However, the tax differential does not seem to affect the share of employment in new firms, as the coefficient is not significantly different from zero. In comparison to table 2, the coefficient for GDP growth turns insignificant for new firms whereas it remains significant for births.

In order to understand the policy implications of the estimated marginal effects of tables 2 and 3, we compute the semi-elasticity of the tax base. The latter measures the percentage change in the corporate tax base following

[20]We focus on domestic income shifting and abstract from considerations on international tax avoidance. This appears reasonable as according to Eurostat data in 2017 small and medium enterprises accounted for the 99.8% of total enterprises in the European Union (EU), and 93.1% of the total was represented by micro enterprises with zero to nine employees. Moreover, we have replicated the analysis excluding EU tax havens (the Netherlands, Belgium, Luxembourg, Ireland and Cyprus, results available upon request). If anything, our estimates grow larger.

Table 2: Income shifting, 1-digit industry level

	Number of firms		Persons employed	
	Active	New	Active	New
	(1)	(2)	(3)	(4)
Tax differential	0.32***	0.20***	0.23***	0.12**
	(0.04)	(0.05)	(0.03)	(0.05)
Starting a business	1.15***	1.07***	0.79***	0.82***
	(0.05)	(0.05)	(0.04)	(0.06)
Real GDP growth	0.42***	0.61***	0.29***	0.68***
	(0.13)	(0.16)	(0.10)	(0.18)
Constant	-22.33***	-21.79***	31.73***	17.08***
	(4.27)	(4.80)	(3.55)	(5.17)
Observations	3,542	3,542	3,542	3,542
R-squared	0.55	0.42	0.59	0.33

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Equation 3 is estimated using as dependent variable the corporate share of the number of active firms and of new firms, and that of persons employed in active and new firms, at the 1-digit industry level. Breaks, industry and year dummies are included but not reported.

a 1%-point increase in the tax differential. It is obtained by dividing the marginal coefficients for the tax differential by the average corporate shares reported at the bottom of table A3. The resulting semi-elasticities are reported in table 4. Depending on whether we consider 1-digit or 2-digits estimates, a 1%-point increase in the tax differential results in a 0.5-0.8% increase in the corporate share of active firms and a 0.3-0.6% increase in the corporate share of new firms. Thus, the 4%-point increase in the average tax differential observed between 2000 and 2016 (figure 1) implies a 1.2–3.2% rise in the corporate share of the economy measured in terms of number of

Table 3: Income shifting, 2-digits industry level

	Number of firms		Persons employed	
	Active	New	Active	New
	(1)	(2)	(3)	(4)
Tax differential	0.22***	0.09***	0.14***	-0.04
	(0.02)	(0.03)	(0.02)	(0.03)
Starting a business	1.21***	1.01***	0.71***	0.70***
	(0.03)	(0.03)	(0.02)	(0.03)
Real GDP growth	0.09	0.36***	-0.02	0.32***
	(0.08)	(0.09)	(0.06)	(0.10)
Constant	-23.22***	-11.54***	41.29***	31.45***
	(2.78)	(3.32)	(1.93)	(3.35)
Observations	10,607	10,607	10,607	10,607
R-squared	0.62	0.47	0.63	0.44

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Equation 3 is estimated using as dependent variable the corporate share of the number of active firms and of new firms, and that of persons employed in active and new firms, at the 2-digits industry level. Breaks, industry and year dummies are included but not reported.

firms. Semi-elasticities for employment are somewhat lower, with a 1%-point increase in the tax differential implying an increase in the corporate share of employment by about 0.2–0.3%.

Our results are smaller than those obtained by De Mooij and Nicodème (2008), who find a semi-elasticity of 2.9 and 1.5 for the number of active and new firms and of 1 for the corporate share of employment. This may be due to several reasons. First, business demography data has been revised over time. Second, our sample includes an additional ten years of data as well as control variables that were not present in their baseline analysis. Third, the

Table 4: Semi-elasticities and elasticities of the tax base

	Number of firms		Persons employed	
	Active	New	Active	New
	semi-elasticities			
1-digit	0.78	0.57	0.28	0.26
2-digits	0.53	0.25	0.18	–
	elasticities			
1-digit	0.15	0.11	0.05	0.05
2-digits	0.11	0.05	0.03	–

Notes: Semi-elasticities are obtained by dividing the marginal coefficients of tables 2 and 3 by the average corporate share of table A3. Elasticities are obtained by dividing semi-elasticities by the change in differential to which the marginal coefficient refers to over the average tax differentials reported in table 1.

sample choices we made resulted in a different set of countries and years.[21]

Next, we obtain elasticities by dividing semi-elasticities by the change in the tax differential over the average tax differentials reported in table 1. This allows comparison with other estimates and accounts for the variation in tax gains (or costs) of incorporation. With elasticities in the range of 0.05-0.15, our results are in line with those of Goolsbee (2004), who finds elasticities in the range of 0.06-0.14 for the United States. Our estimates are somewhat smaller than those of about 0.2-0.5 found by Liu (2014) and Tazhitdinova (2016) for the United States and the United Kingdom, respectively.[22]

Finally, we calculate the change in the tax base. Here we follow De Mooij

[21]We tried to mimic De Mooij and Nicodème (2008) sample in terms of years and countries, yet we did not find similar results (available upon request). We also noticed that there were some discrepancies in reported statutory rates.

[22]See also table A1 in the appendix for a comparison with the literature.

and Nicodème (2008) and write the change in corporate tax revenues as:

$$\Delta R_c = \Delta\tau_c B_c + \Delta B_c \tau_c = \Delta\tau_c B_c \left[1 + \frac{\tau_c}{\Delta\tau_c}\frac{\Delta B_c}{B_c}\right] \tag{5}$$

$\Delta\tau_c B_c$ represents the ex-ante revenue effect from a change in the corporate income tax rate given by the change in corporate tax rates $\Delta\tau_c$ and the corporate tax base B_c. $\Delta B_c/B_c$ is the semi-elasticity of the corporate tax base. The term in brackets in the second part of the equation shows how the ex-post revenue effect differs from the ex ante revenue effect. With a mean corporate tax rate of 23% and a 1% reduction in corporate income tax ($\Delta\tau_c = -1$), the term in squared brackets will become $1 - 0.18 = 0.82$ for a semi-elasticity of 0.8. Thus, an ex-ante reduction in the corporate tax rate of 1 euro will cost 82 cents in terms of lost corporate tax revenues (whereas 18 cents are gained through income shifting from the personal to the corporate tax base). However, corporate tax revenue gains come at the expense of the personal income tax revenue as long as $\tau_p > \tau_c$. For semi-elasticities in the range of 0.2-0.6, a corporate tax rate costing one euro of corporate tax revenue will cost 95-86 cents whereas the gain in income shifting from personal to corporate tax rates will be of 5-14 cents.

4.2 Robustness

We conduct several robustness checks. We focus thereby on the corporate share of active firms, as this variable may better track the behaviour of small business owners in response to income shifting incentives. As in the previous section, we check the strength of the results both at the 1-digit and at 2-digits industry level. Table 5 presents 1-digit results and table A6 in the appendix shows 2-digits estimates.

First, we calculate alternative measures of the corporate share by including partnerships to either the denominator in column 1 or both the numerator and the denominator of the ratio in column 2, as in De Mooij and Nicodème

(2008). Considering partnerships as non-corporate (column 1) reduces the effect of the tax differential whereas considering them as corporate (column 2) increases the effect of the tax differential on incorporation decision. This could be interpreted as evidence that the majority of partnerships are subject to corporate tax treatment. At the 2-digit industry level (table A6), the tax differential has a slightly smaller impact for both measures.

Next, we replace the tax differential with both the personal and corporate top statutory tax rate. Column 3 of table 5 and A6 shows that a higher personal income tax rate significantly increases incorporation whereas a higher corporate income tax rate discourages it. The size of the effect is larger for the corporate income tax rate than for the personal one.

In addition, we replace the EDB indicator with the overall index of economic freedom. The latter is a broader proxy for the extent of pro-business policy that could capture even more country specific characteristics. It is also available over the entire time period of the analysis. If anything, the estimate for the tax differential in column 4 becomes larger when using economic freedom, both at the 1- and the 2-digits industry level.[23]

Moreover, as firms may take time to change their organizational forms in response to changes in tax rates due to transaction costs, we replace the tax differential with its own lag, as reported in column 5. Both at the 1- and 2-digits level, the coefficient estimate for the lagged tax differential remains positive and significant, and closely resembles baseline results. Column 6 reports the results obtained when using the lead of the tax differential, which results in similar patterns as observed for the lag.[24]

[23]Moreover, restricting the time period of the analysis to the availability of the EDB indicator leads to larger coefficients estimates. Results available upon request.

[24]In addition, we included expectations about future business developments proxied by Eurostat (first quarter average of) confidence indicators for industry, construction, retail and services. The tax differential coefficient remained positive and significant. Results available upon request as the indicators are not available for Iceland and Norway and therefore refer to a reduced sample.

Table 5: Robustness checks for the number of active firms, 1-digit level

	Partnerships non-corporate	Partnerships corporate	Separate tax rates	Economic freedom	Lag	Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Tax differential	0.28***	0.34***		0.42***		
	(0.04)	(0.04)		(0.04)		
Personal tax rate			0.28***			
			(0.04)			
Corporate tax rate			-0.50***			
			(0.06)			
Starting a business	1.01***	1.14***	1.15***		1.13***	1.12***
	(0.05)	(0.04)	(0.05)		(0.05)	(0.05)
Real GDP growth	0.52***	0.10	0.31**	0.11	0.48***	0.47***
	(0.13)	(0.12)	(0.13)	(0.13)	(0.13)	(0.13)
Economic freedom				1.75***		
				(0.08)		
Tax differential$_{t+1}$					0.28***	
					(0.04)	
Tax differential$_{t-1}$						0.30***
						(0.04)
Constant	-21.51***	-15.75***	-15.61***	-44.69***	-19.70***	-18.83***
	(4.18)	(3.99)	(4.63)	(5.63)	(4.45)	(4.43)
Observations	3,542	3,542	3,542	3,542	3,344	3,333
R-squared	0.50	0.52	0.55	0.54	0.54	0.55

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Equation 3 is estimated at the 1-digit level using the corporate share of active firms including partnerships as non-corporate in column 1 and as corporate in column 2, including the statutory tax rates instead of the differential in column 3 and using the index of economic freedom instead of the EDB indicator in column 4. Column 5 and 6 include in the regression one lag and one lead of the tax differential, respectively. Breaks, industry and year dummies are included but not reported.

Finally, we have tested the endogeneity of the tax differential on income shifting by using instrumental variables. If countries increase the corporate tax rate or reduce the personal tax in response to expanding corporate shares in the economy, the error term of the regression would be correlated with our main independent variable. This in turn would result in biased estimates of the effect of the tax differential on incorporation.

Table 6: First stage regressions, 1-digit

	(1)	(2)	(3)
Lag 1	0.62***		
	(0.02)		
KOF globalization indicator		0.51***	
		(0.03)	
Government is centre-left and in deficit			-1.86***
			(0.37)
Starting a business	0.08***		0.32***
	(0.02)		(0.02)
Real GDP growth	-0.06	-0.22***	-0.47***
	(0.04)	(0.06)	(0.06)
Constant	2.19	-17.11***	-5.29*
	(1.72)	(2.60)	(2.79)
Observations	3,344	3,542	2,911
R-squared	0.66	0.45	0.46
F-statistic	380.23	1415.58	803.28
Prob > F	0.0000	0.0000	0.0000
Instrument t-value	35.96	15.13	-5.06

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Results are obtained by regressing the tax differential on the instruments (one lag of the tax differential, globalization indicator and center-left government in deficit) at the 1-digit industry level. Break, industry and year dummies are included in the regression but not reported.

First, we instrument the tax differential with its own lag. Next, we use a

globalization indicator, as we expect that more globalized countries would be most affected by international tax competition and levy lower corporate taxes. As this indicator is likely to pick up similar variation as the EDB indicator, we do not include the latter in the instrumented equations to avoid multicollinearity. Finally, we use a measure for whether the government has centre-left orientation *and* has a budget deficit. In comparison to a right-wing government, a centre-left government faced with revenue needs seems more likely to raise corporate taxes.

The relevance of the instruments and the direction of the relationship between instruments and tax differential are tested in the first-stage regressions of table 6. Instruments are statistically significant in explaining the tax differential and display the expected sign. Globalization and lagged differential significantly increase the tax differential whereas a center-left government in deficit is associated, on average, with lower tax differentials. T-tests and F-tests for the first stage regression are large.[25] For the government indicator and the lagged differential, however, there are less observations available.

The results obtained when using instrumental variables estimation for the corporate share of active firms and of persons employed in active firms at the 1-digit industry level are reported in table 7. Estimates show that the impact of the tax differential on incorporation is positive and significant. The results obtained when instrumenting the tax differential with its own lag are larger than in the baseline, yet close to OLS estimates. This holds also when using the globalization index as an instrument, both when corporate shares are measured in terms of number of firms and in terms of employed persons. Finally, when using the government indicator, coefficients increase substantially in size.

[25] As a rule of thumb to avoid selecting weak instruments, the literature suggests that, for a single endogenous regressor, the F-statistic of a joint test for whether all excluded instruments are significantly different from zero should exceed 10. In presence of a single instrument and a single endogenous regressor, this suggests that the t-value for the instrument should be larger than $\sqrt{10} \approx 3.2$. Alternatively, the corresponding p-value should be below 0.0016. This holds for all our instruments.

Table 7: IV results, corporate share of active firms, 1-digit industry level

	1 lag		Globalization		Government	
	Firms	Employed	Firms	Employed	Firms	Employed
	(1)	(2)	(3)	(4)	(5)	(6)
Tax differential	0.45***	0.31***	0.36**	0.65***	1.67***	0.67*
	(0.06)	(0.05)	(0.16)	(0.12)	(0.52)	(0.36)
Starting a business	1.09***	0.76***			0.64***	0.67***
	(0.05)	(0.05)			(0.19)	(0.14)
Real GDP growth	0.51***	0.35***	-0.06	0.16	1.13***	0.68***
	(0.13)	(0.10)	(0.14)	(0.11)	(0.32)	(0.22)
Constant	-20.68***	32.45***	65.89***	84.98***	-11.40	30.90***
	(4.46)	(3.69)	(4.88)	(3.46)	(8.81)	(5.57)
Observations	3,344	3,344	3,542	3,542	2,911	2,911
R-squared	0.54	0.59	0.46	0.53	0.33	0.55

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Results are obtained by estimating equation 3 and instrumenting the tax differential with its own lag, the globalization index and the center-left government in deficit. Break, industry and year dummies are included in the regression but not reported.

Overall, coefficients obtained using IV are larger than OLS estimates, with semi-elasticities for the number of active firms ranging between 0.7–1.2 and those for employment in active firms ranging between 0.2–0.8. This confirms what pointed out by Liu (2014), i.e. that if taxes are endogenous because they change in response to expanding tax bases, OLS estimates are biased towards zero. Therefore, our baseline results can be interpreted as a lower bound to the impact of tax differentials on corporate activity.

5 Tax base effects

5.1 Baseline results

Table 8: Tax base effects

	1-digit		2-digits	
	(1)	(2)	(3)	(4)
Corporate share of active firms	-0.22***	-0.18***	-0.27***	-0.22***
	(0.01)	(0.01)	(0.01)	(0.01)
Starting a business		-0.37***		-0.38***
		(0.04)		(0.02)
Real GDP growth		-0.34***		-0.30***
		(0.07)		(0.04)
Constant	35.76***	62.61***	39.85***	67.00***
	(1.33)	(3.18)	(0.97)	(1.83)
Observations	3,026	3,026	8,877	8,877
R-squared	0.58	0.60	0.63	0.65

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Results are obtained by estimating equation 4 at the 1-digit and 2-digit level, with and without control variables. Break, year and industry dummies are included but not reported. We select on observations for which all measures of corporate shares are available.

Income shifting induced by the tax differential increases the corporate income tax base and erodes the personal income tax base. Thus, given the findings on income shifting and corporate tax base effects, we expect the amount of taxes paid by self-employed entrepreneurs to respond to changes in corporate shares. Table 8 reports the results obtained when estimating equation 4 using data over 2004-2016. An increase in the corporate share of the number of

active firms in the economy results in lower tax revenue paid by the self-employed. Specifically, a unit increase in the corporate share of active firms in the economy reduces the share of revenue paid by the self employed in total capital revenue by 0.2-0.3. The inclusion of controls somewhat reduces the magnitude of the estimates and coefficients size is larger at the 2-digit industry level. Transforming coefficients estimates into semi-elasticities of the personal tax base for the self-employed we obtain estimates between -0.9 and -1.4. Given that we are interested in the effect of a change of about 0.8% in the corporate share resulting from a 1%-point increase in the tax differential, we compute the elasticity of the tax base of $-0.9/(1/0.4) = -0.4$. This in turn corresponds to an approximate 0.3% decrease in the tax base for a 0.8% increase in the corporate share of the economy.

5.2 Robustness

We check the robustness of the effect of the share of active corporate firms on the tax base at the 1-digit industry level in table 9 and at the and 2-digits industry level in table A7 in the appendix. In column 1, we use an alternative definition of the tax base, measured as the ratio of direct tax revenues paid by the self-employed as a percentage of GDP. The estimated effect of the corporate share of active firms on the tax base is somewhat lower compared to baseline. This is in line with the summary statistics reported in table 1. Next, we test the strength of the results to the inclusion of alternative measures of the main independent variable. Specifically, we include the corporate share of new firms in column 2, and the corporate share of employed persons in existing and new firms respectively in column 3 and 4. Although slightly reduced, estimates remain significant.

Overall, these results provide direct evidence of an erosion of the personal tax base in response to a larger corporate share of the economy. In light of the income shifting estimates provided above, these results can be interpreted as additional evidence of behavioral responses of entrepreneurs to differential

Table 9: Robustness of tax base effects, 1-digit

	(1)	(2)	(3)	(4)
Corporate share, number of active firms	-0.14***			
	(0.01)			
Corporate share, number of new firms		-0.16***		
		(0.01)		
Corporate share, employed in active firms			-0.14***	
			(0.01)	
Corporate share, employed in new firms				-0.10***
				(0.01)
Starting a business	-0.53***	-0.39***	-0.49***	-0.50***
	(0.04)	(0.04)	(0.04)	(0.04)
Real GDP growth	-0.05	-0.30***	-0.33***	-0.31***
	(0.06)	(0.07)	(0.07)	(0.07)
Constant	66.26***	62.75***	73.28***	68.65***
	(3.59)	(3.16)	(3.36)	(3.34)
Observations	3,026	3,026	3,026	3,026
R-squared	0.46	0.61	0.57	0.58

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Results are obtained by estimating equation 4 at the 1-digit and 2-digits industry level, with and without control variables. The first four column use an alternative measure of the dependent variable, with and without controls. The last two columns of the panel report the results obtained when using the corporate share of new firms instead of that of active firms as main dependent variable. Break, year and industry dummies are included in the regression but not reported in the table.

personal and corporate income taxes via legal form choice. Besides, they shed some light on the impact of income shifting on crowding out of the personal income tax base.

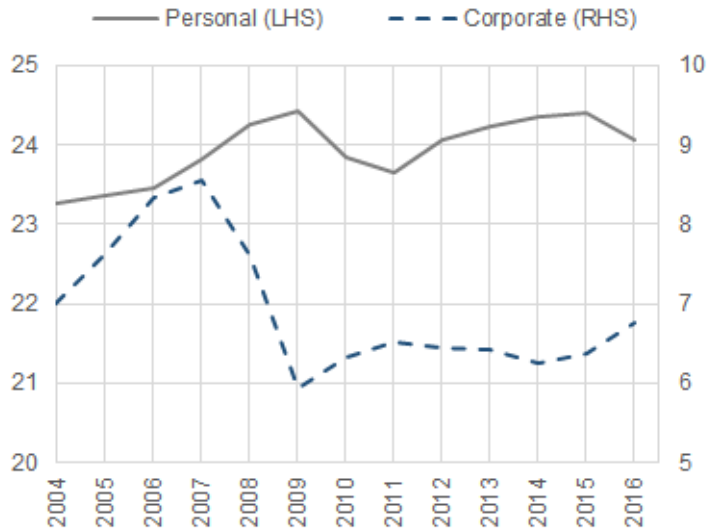
6 Conclusions

We investigate the effect of increasing tax differential between personal and corporate tax rates in Europe on income shifting. We find that differential taxation results in higher corporate shares in the economy. This is in line with behavioral responses of small entrepreneur who self-select into corporate organizational forms in order to be able to shift income across tax bases. Specifically, we find that a 1%-point increase in the tax differential results in a 0.3-0.8% increase in the corporate share of firms and a 0.2-0.3% increase in the corporate share of employment. Our estimates are robust to alternative specifications and to the use of an alternative IV estimator, and can overall be considered as a lower bound to income shifting effects. This revises existing estimates.

In addition, we find that a larger corporate share of the economy implies a decrease in tax revenue paid by the self-employed. Specifically, a 0.8% increase in the corporate share of active firms resulting from a 1%-point increase in the tax differential would correspond to approximately a 0.3% decrease in the personal tax revenues collected from the self-employed. This is consistent with income shifting, as when entrepreneurs incorporate they reclassify part of their personal income as corporate income to pay the lower corporate tax rate. To the best of our knowledge, this is the first available estimate of the direct effect of income shifting on the personal income tax base.

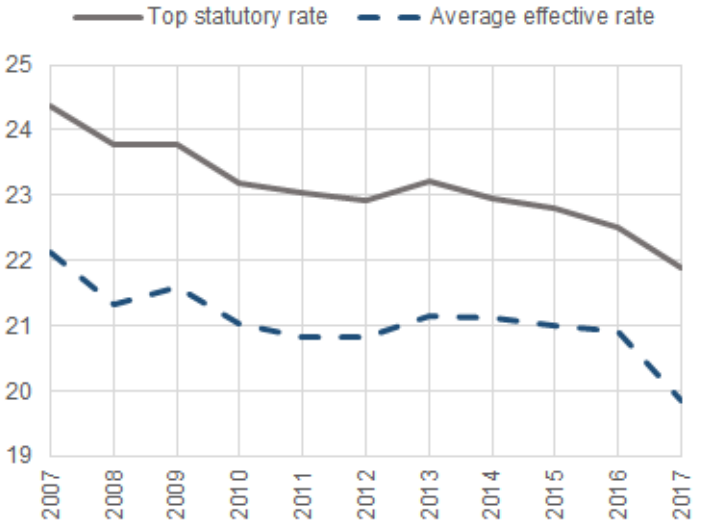
Appendix

Figure A1: Direct income taxes in the European Union, percent of total taxes



Source: European Commission. *Notes:* The figure plots the average direct corporate and personal income taxes in percentage of total taxes for 28 European Union countries.

Figure A2: Top statutory corporate income tax rates vs average effective tax rates, percent



Source: European Commission. *Notes:* The figure plots the average direct corporate and personal income taxes in percentage of total taxes for 28 European Union countries.

Table A1: Comparison with the literature

Author	Corporate share	Coefficient estimate	Average corporate share	Differential change	Average differential	Semi-elasticity	Elasticity
Goolsbee (2004)	firms	0.245	0.626	0.1	0.035	0.39	0.14
	establishments	0.192	0.698	0.1	0.035	0.27	0.10
	employment	0.146	0.860	0.1	0.035	0.17	0.06
De Mooij and Nicodeme (2008)	active firms	0.102	0.357	0.1	0.170	0.29	0.49
	new firms	0.055	0.368	0.1	0.170	0.15	0.26
	employed in active firms	0.082	0.818	0.1	0.170	0.10	0.17
	employed in new firms	0.060	0.586	0.1	0.170	0.10	0.17
Liu (2014)	establishments	0.288	0.344	0.1	0.064	0.84	0.54
	employment	0.343	0.852	0.1	0.064	0.40	0.26
	production	0.309	0.879	0.1	0.064	0.35	0.22

Notes: Calculations based on results reported in the papers. Semi-elasticities are derived by dividing the marginal coeffcients by the average corporate share. Elasticties by dividing the latter by the tax differential change to which the marginal coefficient refers to divided by the average tax differential.

Table A4: Break dummies

Break	**Year**	**Description**
NACE	2008	Reclassification from NACE rev. 1.1 sectoral codes to NACE rev. 2
Austria	2007	Change in threshold (all firms with turnover and or at least one employee included)
Belgium	2009	Inclusion of natural persons that do not have employment and are not VAT registered
Denmark	2008	Small break in employment data
Denmark	2013	Change of unit of employment to headcount
Spain	2002	Unit of employment changed to FTE
Finland	2003	Unit of employment changed to headcount
Finland	2013	Business register data integrated with microdata
France	2009	New enterpise status implemented resulting in a higher number of births
France	2013	Harmonization of employment variables
Ireland	2014	Break not reported in country notes but reported in the data and significant
Italy	2011	Changes in methodology to estimate status of activity and employment
Lithuania	2004	Inclusion of natural persons in the data
Lithuania	2005	Inclusion of natural persons operating without patent in the data
Latvia	2002	Inclusion of natural persons with activities related to patents and farms in the data
Latvia	2004	Access to all individual data may have improved accuracy (no duplication)
Netherlands	2006	New business register that should have gradually decreased coupling loss
Netherlands	2013	Redesign of production system
Netherlands	2010	Change of threshold methodology to define active enterprise (increase in population)
Norway	2001	Methodological changes
Portugal	2008	Break not reported in country notes but reported in the data and significant
Sweden	2011	Inclusion of additional enterprises with postal address outside sweden included
Slovenia	2002	Inclusion of more natural persons

Notes: The table reports the break dummies included in the regression equations of the analysis. The year reported is the first year in which the dummy equals one.

Table A2: Variables definition

Variable	**Definition**	**Source**
Corporate shares of firms	Number of limited liability firms (active or new) divided by the sum of the number of limited liability (active or new) firms and sole proprietorship firms (active or new) and multiplied by 100.	Eurostat Business Demography
Corporate shares of persons employed	Number of persons employed in limited liability firms (active or new) divided by the sum of the number of persons employed in limited liability (active or new) firms and in sole proprietorship firms (active or new) and multiplied by 100.	Eurostat Business Demography
Tax differential	Difference between the top personal statutory income tax rate and the corporate income tax rate.	European Commission and OECD
Corporate tax rate	Top statutory corporate income tax rate (in %), replaced by reduced rates or targeted tax rates (in %) in countries where it is available.	European Commission and OECD
Top statutory corporate tax rate	%	European Commission
Top statutory personal tax rate	%	European Commission
Reduced/targeted tax rates	%	OECD
Real GDP growth	Gross domestic product at mmarket prices, real, % change over previous period	Eurostat
Starting a business	Measure distance to frontier for the ease of starting a business. Based on information regarding the time (days), cost, number of procedures and minimum capital (in percent of income per capita) necessary to start a business for a small-to medium-size limited liability company in each economy's largest business city.	World Bank
Economic freedom	Based on 12 quantitative and qualitative factors pertaining to rule of law, government size, regulatory efficiency and market openness graded on a scale of 0 to 100.	Heritage Foundation
KOF (de facto) globalization index	Index scaled from 0 to 100 comprising economic, social and political globalization variables.	KOF Swiss Economic Institute
Centre-left government	Party orientation with respect to economic policy, 1 if centre-left and zero otherwise. Indicator based on variable EXECRLC	World Bank database of political institutions
Government deficit	Net lending or borrowing, % of GDP	Eurostat
Self-employed tax revenues, % of capital taxes	Tax revenues paid by the self employed as a percent of total capital tax revenues	European Commission
Self-employed tax revenues, % of direct taxes	Tax revenues paid by the self employed as a percent of total direct tax revenues	European Commission

Table A3: Country specific average corporate shares

	Number of firms		Persons employed	
	Active	New	Active	New
Austria	18.84	14.75	68.16	27.71
Belgium	60.11	52.91	88.33	59.89
Cyprus	52.93	49.96	84.97	67.46
Czech Republic	17.56	16.34	70.96	28.98
Germany	21.38	14.64	72.40	20.34
Denmark	45.47	39.28	85.50	38.35
Spain	38.06	29.06	75.99	43.81
Finland	44.97	31.06	91.82	52.75
France	43.74	38.15	75.09	49.67
United Kingdom	70.88	74.43	92.66	79.70
Hungary	38.14	37.70	77.10	55.25
Ireland	47.66	45.64	83.11	41.28
Iceland	63.81	52.22	93.21	56.92
Italy	19.51	19.02	65.77	30.08
Lithuania	35.68	20.26	83.02	49.31
Luxembourg	73.87	75.06	90.54	76.75
Latvia	64.87	54.47	93.17	74.34
Netherlands	25.52	14.85	83.76	37.37
Norway	47.57	33.37	89.72	53.60
Poland	6.81	6.53	51.72	19.43
Portugal	30.43	25.12	75.63	40.12
Sweden	47.63	34.76	87.31	43.26
Slovenia	35.79	27.78	78.09	37.73
Slovakia	27.15	28.12	68.99	38.67
Average	40.77	34.81	80.29	46.78

Notes: Own calculations obtained averages across 1-digit sectors and time for each country. We select on observations for which all measures of corporate shares are observed.

Table A5: Reclassification of NACE activities

ID	NACE 1.1	NACE 2	DESCRIPTION
A00	C	B	Mining and quarrying
B00	D	C	Manufacturing
B01	DA	C10-C12	Manufacture of food products, beverages, and tobacco
B02	DB	C13_C14	Manufacture of textiles, wearing apparel, and other textile products
B03	DC	C15	Manufacture of leather and leather products
B04	DD	C16	Manufacture of wood, wood and cork products (except furniture), articles of straw, and plating materials
B05	DE	C17_C18, J58	Manufacture of pulp, paper, and paper products; publishing and printing
B06	DF	C19	Manufacture of coke, refined petroleum products, and nuclear fuel
B07	DG	C20_C21	Manufacture of chemicals, chemical products, man-made fibres, basic pharmaceutical products, and pharmaceutical preparations
B08	DH	C22	Manufacture of rubber and plastic products
B09	DI	C23	Manufacture of other non-metallic mineral products
B10	DJ	C24_C25	Manufacture of basic metals and fabricated metal products except machinery and equipment
B11	DK	C28	Manufacture of machinery and equipment n.e.c.
B12	DL	C26_C27	Manufacture of electrical equipment, computer products, electronic products, and optical products
B13	DM	C29_C30	Manufacture of motor vehicles, trailers, semi-trailers, and other transport equipment
B14	DN	C31_C32	Manufacture of furniture and other manufacturing
B15		C33	Repair and installation of machinery and equipment
C00	E		Electricity, gas, water supply
C01	E40	D	Electricity, gas steam, air conditioning, and hot water supply
C02	E41,O90	E	Water supply, sewerage, waste management, and remediation activities
D00	F	F	Construction
E00	G	G	Wholesale and retail trade
E01	G50	G45	Wholesale trade, retail trade, and repair of motor vehicles and motorcycles
E02	G51	G46	Wholesale trade and commission trade except of motor vehicles and motorcycles
E03	G52	G47, S95	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
F00	H	I	Hotels and restaurants
F01	H551_H552	I55	Hotels, camping sites, and other provisions of short-stay accommodation
F02	H553-H555	I56	Food and beverage service activities

This table illustrates the classification structure used to match NACE 1.1. to NACE 2 data following the change in 2008. We broadly follow the reclassification used by Bergner and Heckemeyer (2017), although with some minor changes.

Table A5: Reclassification of NACE activities (ctd.)

ID	NACE 1.1	NACE 2	DESCRIPTION
G00	I	H	Transport, storage and communications
G01	I60	H49	Land transport and transport via pipelines
G02	I61	H50	Water transport
G03	I62	H51	Air transport
G04	I63	H52, N79	Warehousing and support activities for transportation; travel agency, tour operator, and other reservation service and related activities
G05	I64	H53, J61	Postal and courier activities; telecommunications
H00	K	N	Real estate and business activities
H01	K70, K71	N77	Rental and leasing activities
H02	K72	J62	Computer programming, consultancy, and related activities
H03	K73	M72	Scientific research and development
H04	K7411, K7412	M69	Legal, accounting, book-keeping, and auditing activities; tax consultancy
H05	K7414	M70	Activities of head offices and management consultancy activities
H06	K742, K743	M71	Architectural activities, engineering activities, related technical consultancy, technical testing, and technical analysis
H07	K7413, K744	M73	Advertising, market research, and public opinion polling
H08	K745	N78	Employment activities
H09	K746	N80	Security and investigation service
H10	K747	N81	Services to buildings and landscape activities
H11	K748	M74, N82	Other professional, scientific, and technical activities; office administrative, office support, and other business support activities
I00	M	P	Education
L00	N	**S**	Health and social work
L01		M75	Veterinary activities
L02		Q	Human health and social work activities
M00	O	M	Others
M01	O91	S94	Activities of membership organizations
M02	O92	J59-60, J63, R90-93, R96	Recreational, cultural and sporting activities
M03	O93	S96	Other personal service activities
N00	K	K	Finance and insurance
N01	J66	K65	Insurance, reinsurance and pension funding, except compulsory social security
N02	J67	K66	Activities auxiliary to financial services and insurance activities

Table A6: Robustness checks for the number of active firms, 2-digits level

	Partnerships non-corporate	Partnerships corporate	Separate tax rates	Economic freedom	Lag	Lead
	(1)	(2)	(3)	(4)	(5)	(6)
Tax differential	0.21***	0.20***		0.35***		
	(0.02)	(0.02)		(0.03)		
Personal tax rate			0.12***			
			(0.02)			
Corporate tax rate			-0.72***			
			(0.03)			
Starting a business	1.06***	1.19***	1.20***		1.18***	1.19***
	(0.03)	(0.03)	(0.03)		(0.03)	(0.03)
Real GDP growth	0.31***	-0.23***	-0.23***	-0.18**	0.14*	0.12
	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)
Economic freedom				1.56***		
				(0.05)		
Tax differential$_{t-1}$				0.20***		
					(0.02)	
Tax differential$_{t+1}$					0.20***	
						(0.02)
Constant	-23.03***	-15.47***	-4.95*	-30.88***	-20.10***	-21.22***
	(2.78)	(2.53)	(2.96)	(3.60)	(2.91)	(2.92)
Observations	10,607	10,607	10,607	10,607	9,987	9,979
R-squared	0.58	0.61	0.63	0.58	0.62	0.61

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Equation 3 is estimated at the 2-digits level using the corporate share of active firms including partnerships as non-corporate in column 1 and as corporate in column 2, including the statutory tax rates instead of the differential in column 3 and using the index of economic freedom instead of the EDB indicator in column 4. Column 5 and 6 include in the regression one lag and one lead of the tax differential, respectively. Breaks, industry and year dummies are included but not reported.

Table A7: Robustness of tax base effects, 2-digits

	(1)	(2)	(3)	(4)
Corporate share, number of active firms	-0.19***			
	(0.01)			
Corporate share, number of new firms		-0.18***		
		(0.00)		
Corporate share, employed in active firms			-0.20***	
			(0.01)	
Corporate share, employed in new firms				-0.15***
				(0.00)
Starting a business	-0.55***	-0.45***	-0.51***	-0.53***
	(0.02)	(0.02)	(0.02)	(0.02)
Real GDP growth	0.05	-0.22***	-0.25***	-0.22***
	(0.04)	(0.04)	(0.04)	(0.04)
Constant	71.05***	69.17***	82.25***	75.48***
	(2.04)	(1.87)	(1.95)	(1.93)
Observations	8,877	8,877	8,877	8,877
R-squared	0.52	0.65	0.62	0.64

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Results are obtained by estimating equation 4 at the 1-digit and 2-digit level, with and without control variables. The first four column use an alternative measure of the dependent variable, with and without controls. The last two columns of the panel report the results obtained when using the corporate share of new firms instead of that of active firms as main dependent variable. Break, year and industry dummies are included in the regression but not reported in the table.

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